Remarks

Claims 21-40 are pending. Favorable reconsideration is respectfully requested.

Claims 21-36 have been rejected under 35 USC § 112, ¶ 2 with respect to the claim language. Applicants wish to express their appreciation to Examiner Reddick for her thoughtful suggestions of alternative language. These suggestions have been adopted in their entirety. Additionally, the spelling of "ethylenically" has been corrected in several instances. Withdrawal of the rejections of the claims under 35 USC § 112, ¶ 2 is solicited.

In addition, claim 21 has been amended to more particularly point out and distinctly claim what Applicants regard as their invention. The adhesives are now recited to be "hydraulically setting" which should be evident from reading the specification and examples, i.e. tile adhesives containing portland cement or gypsum. Both cement-containing and gypsum-containing (plaster of paris) are hydraulically setting. Second, the claims have been amended to recite the presence, in cementitious compositions, of 5-80% cement, 5-80% filler (i.e. sand, crushed calcium carbonate, etc.), and 0.5 to 60 weight percent protective colloid polymer powder when a redispersible polymer powder is employed. Support may be found on page 12, last paragraph for the latter. Finally, claim 21 has been amended to recite that the protective colloid is a partially rather than fully hydrolyzed polyvinyl alcohol polymer. Support may be found in the specification on page 8, last paragraph. None of the amendments raise any issue of new matter.

The present invention is directed to an improvement in hydraulically setting construction adhesives of the cementitious or cement-free (e.g. gypsum) type. It is not directed to such products as wood adhesives. Construction adhesives are used as mortars, tile adhesives, and the like. It is necessary that these products exhibit water resistance. In the past, such water resistance was added by employing polymer additives containing hydrophobic monomer units. Applicants have found, quite surprisingly, that improved water resistance can

be achieved by employing a low and defined range of hydrophilic monomer units. One skilled in the art would expect such monomers to decrease rather than improve water resistance.

The amount of hydrophilic monomer is critical, however, and must be within the range of 0.2 to 1.5 weight percent. If the content is above 1.5 weight percent, the combination of water resistant properties (storage at 50% humidity, dry storage followed by wet storage, etc., *see, e.g.* the test conditions on page 16) decreases to levels below that of polymer additives containing none of the hydrophilic monomer. Reference may be had to Table 2, for example, a portion of which is presented below, and

Example	Auxiliary Monomer	Amount	(1)	(2)	(3)	(4)	(Σ1-4)
C"A"	none	0	1.67	0.72	1.64	0.62	4.65
1	**acrylamide**	**0.2**	**2.06**	**0.9**	**1.91**	**0.88**	**5.75**
2	**acrylamide**	**1.5**	**1.95**	**1.11**	**2.31**	**0.95**	**6.32**
C3	acrylamide	2.0	1.67	0.6	1.21	0.59	4.07
C"A"	none	0.	1.67	0.72	1.64	0.62	4.65
4	**acrylic acid**	**0.2**	**1.94**	**0.86**	**2.38**	**0.89**	**6.07**
5	**acrylic acid**	**1.5**	**1.74**	**0.85**	**1.94**	**0.92**	**5.45**
C6	acrylic acid	2.0	1.64	0.8	1.74	0.85	5.03
C7	acrylic acid	3.0	1.61	0.55	2.04	0.44	4.64
C"A"	none	0	1.67	0.72	1.64	0.62	4.65
8	**AMPS**	**0.2**	**2.06**	**0.9**	**1.94**	**0.63**	**5.53**
9	**AMPS**	**1.5**	**1.76**	**1.112**	**1.62**	**1.03**	**5.53**
C10	AMPS	2.0	1.65	0.95	1.55	0.8	4.95
C11	AMPS	3.0	1.47	0.67	1.53	0.7	4.37

where the tensile strengths of first entries, with no auxiliary monomer (C"A"), and with acrylamide, acrylic acid, and 2-acrylamido-2methylpropanesulfonic acid (AMPS) are tabulated, and the sum of tensile strengths under the various testing conditions are indicated also.

As can be seen from the table, all the inventive compositions (bold) showed a considerable overall increase in properties, even with only 0.2 weight percent auxiliary monomer. By 1.5 weight percent, the improvement had leveled off or decreased, while at 2.0 weight percent, the properties were worse than with no auxiliary monomer, or improved only insignificantly. Higher levels of hydrophilic monomers led to further decreases in physical properties.

Claims 21-40 have been rejected under 35 USC § 102(b) or under 35 USC § 103(a) over *Schilling* U.S. Patent 5,932,647. *Schilling* is not directed to the claimed subject matter, but rather is directed to wood glues having low minimum film forming temperatures ("MFT"). Common wood glues such as Elmers™ white glue and TiteBond™ aliphatic (yellow) wood glues employ vinyl acetate polymers and copolymers, together with polyvinyl alcohol. At column 4, beginning at line 51, the polyvinyl alcohol polymers are disclosed, all being fully hydrolyzed, i.e. hydrolyzed in excess of 96 mol percent. These polymers are necessary to achieve the improvement in MFT. No partially hydrolyzed (< 95 mol percent) polyvinyl alcohol polymers are disclosed as being useful. In fact, Comparison Example 1 (cols. 7-8) discloses a vinyl acetate polymer prepared in the presence of a partially hydrolyzed polyvinyl alcohol polymer. A high film forming temperature resulted. Thus, *Schilling* teaches away from the use of partially hydrolyzed polyvinyl alcohols.

At column 3, lines 19-38, *Schilling* discloses that 0.05 to 10.0 weight percent of auxiliary monomers may be used. The auxiliary monomers listed are virtually all hydrophilic, water soluble monomers. Such monomers are used in Examples 2 and 3 (N-methylolacrylamide) in amounts of 4.0 and 5.0 weight percent, respectively.

Construction adhesives, i.e. mortar based tiled adhesives, have completely different uses and require different properties as compared to wood adhesives. Wood is a lignocellulosic product with an equilibrium water content, even when dry, which requires adhesives different from the polymer additives of tile adhesive. While in wood adhesives it is the polymer itself which bonds the wood together, in tile adhesives, primary bonding is by the cement or gypsum contained in the hydraulically setting mortar. The polymer powder adds

tensile strength, elongation, and aids in adhesion, but is not the primary adhesive. One skilled in the art, wishing to prepare a water resistant construction adhesive, would not be motivated to look to *Schilling*, which is directed to wood adhesives.

The Examiner is correct that it is the broad teachings of the reference which are considered relative to patentability of a later filed application. However, merely because claim limitations fall within broad disclosed ranges does not mean that the claim is unpatentable. There must be a disclosure of the actual invention to anticipate (§ 102) or motivation to select the claimed range (§ 103).

Schilling does, at column 5, disclose preparation of spray dried polymer dispersions, using anticaking agents which can include "cements." However, it is unknown what is meant by the latter term. It may refer to ground up (pulverized) concrete, but it certainly cannot refer to hydraulically setting cement such as Portland cement. Anticaking agents are added to prevent agglomeration of the polymer particles during storage, where water will be present in the surrounding atmosphere (relative humidity). If a hydraulically setting cement were employed, rather than serve as an anticaking agent, absorption of humidity from the atmosphere would rapidly cause agglomeration. Such agglomeration would also occur in the spray drying unit, since the aqueous polymer dispersions liberate considerable water (about 50-70% by weight) during spraying in the spray drying unit, which would cause any hydraulically setting cement portions to agglomerate to set cement particles.

The claims have been amended to recite that the construction adhesives contain at least 5% of an inorganic binder (hydraulically setting cement, gypsum, etc.), and at least 5% of an inorganic filler (sand, crushed calcium carbonate (limestone), etc.) Wood glues do not contain such ingredients, since these would prevent the wood to be glued from closely abutting such that a strong bond could be obtained.[1] The claims have also been amended to

[1] The claim requires these ingredients when a redispersible polymer powder is employed. These amounts are over and above any amounts of anticaking agents added to the redispersible polymer powder during its drying.

recite that the polyvinyl alcohol employed is a partially hydrolyzed polyvinyl alcohol. *Schilling* teaches that only fully hydrolyzed polyvinyl alcohols are suitable in his wood adhesives. Based on these claim amendments, it is believed clear that *Schilling* neither anticipates the claimed subject matter nor renders it obvious, and withdrawal of the rejections over *Schilling* under 35 USC §§ 102(b) and 103(a) is solicited for these reasons.

However, *Schilling* also does not disclose, nor does he teach or suggest the claimed range of 0.2 to 1.5 weight percent of hydrophilic monomer. *Schilling* does, as indicated earlier, disclose a range of 0.05 to 10 weight percent for "auxiliary monomers." However, this range is one suitable for wood glues, which function in a hydrophilic, cellulose-hydroxyl rich environment, not in the environment of a hydraulically setting construction adhesive. Applicants have found that if hydrophilic monomers are used in the range of 0.2 to 1.5 weight percent, significant improvement in water resistance is obtained. *Schilling*, on the other hand, teaches that if water resistance is to be obtained, hardeners such as soluble acidic metal salts, or crosslinking agents such as isocyanates or formaldehyde/phenol or formaldehyde/urea resins should be added.

The examples of *Schilling* are also instructive. The examples which employ auxiliary monomers use these monomers in amounts of 4-5%. These amounts may be quite acceptable for wood glues, but are not acceptable in construction adhesives. Applicants have shown, for example, that at 3%, construction adhesive water resistance is in every case considerably lower than that achieved from polymer dispersions containing no hydrophilic monomers. The improvement in water resistance achieved by the subject invention disappears when the hydrophilic monomer content rises above 1.5 weight percent. The range of 0.2 to 1.5 weight percent is critical. Below 0.2%, no improvement over the base polymer is achieved, whereas by 2 weight percent, the substantial improvement has already disappeared. For example, with 1.5 weight percent of acrylamide, an improvement of 36% in tensile strength (6.32 versus 4.65) is obtained, whereas at 2.0 weight percent, a decrease in tensile strength of 12% occurs. *Schilling* does not teach or suggest that such an improvement could be obtained in construction adhesives, a field with which he is not concerned, by adding hydrophilic monomers in the range of 0.2 to 1.5%. Rather, *Schilling* completely fails to

recognize any improvement by adding such monomers. The 4 and 5% of auxiliary monomers he adds in the examples where he uses such monomers would produce construction adhesives which are highly deficient. For these reasons also, the claims are believed patentable over *Schilling*.

Claims 21-40 have been rejected under 35 USC § 102(e) or under 35 USC § 103(a) over *Geissler* U.S. Patent 6,331,587 ("*Geissler*"). Unlike *Schilling, Geissler* is relevant to construction adhesives, suggesting that his polymers be employed in portland cement-based compositions, for example. However, *Geissler* is not directed to the problem solved by Applicants, improving water resistance of construction materials employing polymer additives, but rather is directed to the problem of supplying high solids aqueous dispersions of relatively low viscosity. *Geissler* solves this problem by employing water soluble cationic azo polymerization initiators (catalysts) rather than the conventional redox-type initiators.

Geissler discloses numerous optional comonomers beginning at column 2, line 48 to column 3, line 3. In the paragraph beginning at column 2, line 61, two classes of hydrophilic monomers are disclosed, ethylenically unsaturated monocarboxylic acids and ethylenically unsaturated dicarboxylic acids, useful in amounts of up to 5% by weight (column 3, line 2); preferably 0.1 to 5% by weight. However, *Geissler* never employed such monomers in any example, much less in Applicants' critical range of 0.2 to 1.5 weight percent. Moreover, the list of monomers said to be suitable in amounts of up to 5% by weight also include hydrophobic monomers such as the diesters of dicarboxylic acids. As with *Schilling, Geissler* was completely unaware that portions of hydrophilic monomers within the claimed range, could result in such a great improvement in water resistance of construction adhesives.

It is well established that the problem solved is highly relevant to patentability. In the case of *In re Shaffer*, 108 USPQ 326 (CCPA 1956), for example, the CCPA clearly stated that a reference which does not discuss the problem addressed cannot suggest a solution to the problem, and is not an obviousness-defeating reference under 35 USC § 103. This precept applies both to *Schilling* and to *Geissler*, as neither reference addresses water resistance of construction adhesives.

Water resistance is a noteworthy problem in construction adhesives such as tile adhesives, and is the problem addressed by Applicants. One skilled in the art, seeking to solve this problem, would receive no guidance from *Geissler*, who does not even mention the problem. Since hydrophilic monomers are expected to encourage water absorption, were one motivated to produce a *Geissler*-type polymer (using cationic azo initiators) and to experiment to increase water resistance, one skilled in the art would be motivated to modify the polymer by incorporating hydrophobic monomers such as those disclosed by *Geissler* at column 2, lines 48-60. Moreover, even had one so skilled been motivated to employ ethylenically unsaturated carboxylic acids, and had chosen an amount squarely in the midrange of *Geissler's* 0.1 to 5 weight percent, i.e. 2.5 weight percent, this skilled artisan would have found that water resistance decreased, rather than increased. Only within the critical range of 0.2 to 1.5 weight percent is any significant improvement obtained.

This is not a case where the prior art (*Geissler*) discloses an example falling within the claimed range, but failed to recognize any benefit. Rather, *Geissler* never prepared any composition within the claimed range. One skilled in the art, desirous of increasing water resistance of construction adhesive polymer additives, would not be directed to the present invention by *Geissler*. Although *Geissler* discloses a range of certain monomers (not all of which are hydrophilic, i.e. dicarboxylic acid diesters) which includes Applicants' claimed range, *Geissler* provides no motivation, first, to select hydrophilic monomers, and second, to use those monomers only in the critical claimed range of 0.2 to 1.5 weight percent. Thus, *Geissler* does not anticipate the claimed subject matter, nor does he render this subject matter obvious.[2] The present invention is a narrow "selection" invention which provides highly unexpected results, and as such is patentable over *Geissler*. Withdrawal of the rejections over *Geissler* under 35 USC §§ 102 and 103 is solicited.

Applicants submit that the claims are now in condition for Allowance, and respectfully request a Notice to that effect. If the Examiner believes that further discussion

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[2] As stated in *In re Kalm*, 154 USPQ 10 (CCPA 1967), a reference which does not render an invention obvious cannot anticipate under 35 USC § 102.

will advance the prosecution of the Application, she is highly encouraged to telephone Applicants' attorney at the number given below.

Respectfully submitted,

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Attachment

VERSION WITH MARKINGS TO SHOW CHANGES MADE

21. (Amended) In [an] a hydraulically settable inorganic binder-based construction adhesive [of the] which is cementitious or cement-free, [type] in which an aqueous polymer dispersion or redispersible polymer powder is added, the improvement comprising adding as at least a portion of said aqueous polymer dispersion or redispersible polymer powder, a polymer prepared by emulsion polymerization in the presence of a protective colloid, said polymer prepared from monomers comprising at least one vinyl ester monomer and from 0.2 to 1.5 weight percent, based on the total weight of all monomers, of an auxiliary monomer having a water solubility higher than vinyl acetate, wherein said cementitious construction adhesives comprises from 5 to 80 weight percent cement, from 5 to 80 weight percent of filler, and from 0.5 to 60 weight percent protective colloid stabilized polymer powder when a redispersible polymer powder is employed, and wherein said protective colloid is a partially hydrolyzed polyvinyl alcohol having a degree of hydrolysis less than 95 mol percent.

23. (Amended) The construction adhesive of claim 21 wherein [at least one] said auxiliary monomer is at least one selected from the group consisting of [ethyleneically] ethylenically unsaturated monocarboxylic acids, [ethyleneically] ethylenically unsaturated dicarboxylic acids and anhydrides thereof, ethylenically unsaturated carboxamides, ethylenically unsaturated carbonitriles, ethylenically unsaturated sulfonic acids, and salts of the acid monomers of this group.

24. (Amended) The construction adhesive of claim 21, wherein said [at least one] auxiliary monomer is at least one selected from the group consisting of acrylic acid, acrylamide, 2-acrylamido-2-methylpropane sulfonic acid, vinylsulfonic acid, maleic anhydride, acrylamidoglycolic acid, and itaconic acid.

25. (Amended) The construction adhesive of claim 21, wherein said monomers further comprise at least one [further] monomer or monomer mixture selected from

the group consisting of ethylene, ethylene and fumaric acid, ethylene and maleic acid diesters, ethylene and vinyl chloride, acrylic acid esters, and ethylene and acrylic acid esters.

39. (Amended) The process of claim 37 wherein the at least one auxiliary monomer is selected from the group consisting of acrylic acid, acrylamide, 2-acrylamido-2-methylpropane sulfonic acid, vinylsulfonic acid, maleic anhydride, acrylamidoglycolic acid, and itaconic acid.